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(54) Title of the Invention: METHOD FOR MANUFACTURE OF INSULATING SHEET FOR PRINTED CIRCUIT

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### Specification

1. Title of the Invention: METHOD FOR MANUFACTURE OF INSULATING SHEET FOR PRINTED CIRCUIT

#### 2. Patent Claims

A method for the manufacture of an insulating sheet for a printed circuit by preparing prepregs obtained by impregnating sheet-like substrates with a resin and drying, preparing a granular or particulate molding material obtained by mixing and kneading a filler and a resin, placing said molding material between the prepregs so that it is located in the central layer, and press molding under heating.

#### 3. Detailed Description of the Invention

Field of Industrial Utilization

The present invention relates to a method for the manufacture of an insulating sheet for a printed circuit employed as an electrically insulating material in electric and electronic devices.

#### Description of Prior Art

Insulating sheets for printed circuits have been manufactured by impregnating sheet-like substrates, for example, from paper, various fiber clothes, and mats, with a thermosetting resin such as a phenolic resin, melamine resin, polyester resin, epoxy resin, silicone resin and the like, drying, laminating a plurality of the obtained prepregs, and press molding the laminate under heating.

#### Problems Addressed by the Invention

However, the drawback of the aforementioned sheet-like substrates is that they are prepared by processing pulp or glass fibers into paper or glass cloth. Such a process is costly and involves many operations. To resolve this problem, it was suggested to prepare a granular or particulate molding material by mixing and kneading a filler such as pulp, glass fibers and the like with a resin, injection or compression molding the molding material into a sheet-like molding, and using the molding as an insulating substrate for a printed circuit. However, when the sheet layer was thin, the strength, for example, bending strength, was insufficient and the molding was unsuitable for wide practical applications.

It is an object of the present invention to provide an insulating sheet for printed substrates which maintains a sufficient mechanical strength at a low cost.

#### Means to Resolve the Problems

In order to attain the above-described object, the present invention provides a method for the manufacture of an insulating sheet for a printed circuit by preparing prepregs obtained by impregnating sheet-like substrates with a resin and drying, preparing a granular or particulate molding material obtained by mixing and kneading a filler and a resin, placing the molding material between the prepregs so that it is located in the central layer, and press molding under heating.

#### Operation

In accordance with the present invention, the central layer consists of a molding material. Therefore, the utilized amount of the sheet-like substrate is decreased accordingly and the cost is reduced. At the same time, the mechanical strength of the insulating sheet is sufficiently maintained by the sheet-like substrates arranged on both sides.

#### Embodiment

The sheet-like substrate used in accordance with the present invention is from paper, glass cloth, cotton cloth, polyester cloth and the like, and the prepregs are manufactured by impregnating the substrate with a thermosetting resin such as a phenolic resin, melamine resin, polyester resin, epoxy resin, silicone resin and the like, followed by drying. Furthermore, the

granular or particulate molding material is obtained by mixing and kneading the thermosetting resin with an inorganic filler such as glass fibers, glass powder, clay and the like, or organic filler such as pulp, wood powder and the like.

An embodiment of the present invention will be described below.

#### Embodiment 1

A total of 50 wt. parts of glass fibers (length 3 mm) and a resin composition consisting of 40 wt. parts of an epoxy resin (Shell Chemical Co., trade name Epicoat 1001), 7 wt. parts of dicyandiamide as a curing agent, and 0.5 wt. part of 2-ethyl-4-methylimidazole as a catalyst were mixed and kneaded by the usual method to obtain a molding material. The resin composition was separately dissolved in methyl ethyl ketone to obtain a varnish with a content of solids of 50%. A glass cloth was impregnated with the varnish. Subsequent drying for 5 min at a temperature of 140°C produced a prepreg.

The molding material prepared in the above-described manner was placed between the prepregs and the laminate was press molded under heating in a die to obtain an insulating sheet for a printed circuit.

#### Comparative Example 1

Only the molding material identical to that used in Embodiment 1 was press molded under heating in a die to obtain an insulating sheet for a printed circuit having the same thickness as the sheet prepared in Embodiment 1.

Physical characteristics of the insulating sheets obtained in Embodiment 1 and Comparative Example 1 are presented in Table 1.

Table 1

	Embodiment 1	Comparative Example 1	Test method
Bending strength (kg/mm <sup>2</sup> )	45	20	According to JIS C 6481
Modulus of elasticity in bending (kg/mm <sup>2</sup> )	2500	1500	
Isod impact strength (kg-cm/cm <sup>2</sup> )	20	3	According to JIS C 6911

#### Effect of the Invention

Data presented in Table 1 show that the present invention makes it possible to obtain an insulating sheet for a printed circuit with a high mechanical strength. Moreover, since a small amount of a sheet-like substrate is used, the manufacture can be conducted at a low cost. Accordingly, the present invention has a very high industrial value.

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